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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •

JANUARY 27, 1934

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The Weekly Summary of Current Science

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DO YOU KNOW?

A museum of Jewish life and art has been opened in Chicago.

Australia's experiments with wool as a binder for pavement have proved unsuccessful.

A fungus that causes infections of lungs and windpipe has been found and described as a new species.

New York expects to see its Planetarium, at the American Museum of Natural History, completed by the spring of 1935.

A new aid for navigators is a "fog camera" which sees through fog and records on special film what it sees, working at 30-second intervals.

Making phonograph records of the native music of African tribes will be one task of the Straus West African Expedition of the Field Museum.

Adelie penguins of the Antarctic feed mainly on little shrimp-like crustacea which abound in the water.

A bronze statue to David Livingstone is to be placed in Victoria Falls Park in Southern Rhodesia, by the waterfall he discovered in 1855.

The United States gained 71 new airports and landing fields in 1933, not including new airports being established by the CWA committees.

Soy meal bread, showing only a fourth as much sugar-forming substance as ordinary bread, is being made on factory scale for diabetic patients in Austria.

The fossil bones of a full-grown carnivorous dinosaur 30 inches long—no bigger than a dog—and representing a new species, have been found in Montana.

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These curiosity-arousing questions show at a glance the wide field of scientific activity from which this week's news comes. Book references in italic type are not sources of information for the article, but are references for further reading. Books cited can be supplied by Book Department, Science News Letter, at publishers' prices, prepaid in the United States.

ANTHROPOLOGY

Accuracy of History Checked By Study of Famous Bones

Dante's Skull Examined; Remains of English Princes Confirm Their Murder by Richard the Third

THE SCIENTIFIC study of famous bones is making progress.

It is not so long since sentiment was strong against disturbing the rest of kings and poets. Shakespeare had expressed himself for the tribe of famous folk emphatically in his curse on those who moved his bones. That Shakespearian tombstone, and the superstition that a curse awaited those who dared poke about royal tombs of Egypt, were enough to give the world an uneasy feeling over troubling the famous dead.

But archaeology and anthropology and other related sciences that probe into man's past have "grown up" during the past century. And public confidence in scientific methods has grown up, too. When experts examine a burial of a famous person to prove identity, or to learn about physical traits of greatness, or to check troublesome points of history, they bring to the task all the latest devices of measurement. X-ray science, chemical tests, and anatomical knowledge—and an honest respect.

Bones of the poet Dante were committed to the care of Prof. F. Frassetto in 1921, when the tomb was opened on the six hundredth anniversary of Dante's death. Now, twelve years later, the professor has published his report. It covers 200 pages and includes 95 illustrations.

His Skull Indeed

The outline of Dante's skull has been compared with various busts. It is found to fit with the Vela bust, and in most respects it fits with other sculptured representations of the poet. There seems no reason to doubt that this is indeed the skull of the great poet genius.

Remarkable possibilities of modern anatomy have been shown by recent examination of the remains of the two English princes murdered in the Tower of London. The bones, removed from a marble urn in Westminster Abbey, were examined by the Dean of Anatomy of the London Hospital Medical College, Prof. William Wright. The King of England lent his permission for the exhumation and study.

Identity of the bones was established by various tests. The bones were those of immature persons, as shown by lack of union of the shoulder sockets and hip joints. X-rays of the teeth set the ages of the boys at ten and twelve years, showing that they died in 1483, and therefore at the instigation of their uncle who became Richard the Third—a point on which English history has been exceedingly uncertain.

Relationship Seen

If further proof of identity were needed, the skulls of the princes suggested blood relationship. There were unusually large supplementary bones in the cranial sutures. The milk teeth were congenitally absent. There were traces of dental diseases suggesting a common hereditary weakness in the enamel of the teeth.

That the boys were smothered by pillows, as tradition avers, is confirmed by the testimony of their bones. Over the facial bones of Edward, the prince whose skull is most complete, lay a red and brown stain following the cheek's contour. It is interpreted as being the stain of blood from intense congestion of the face caused by strangulation.

The famous missing skull of René Descartes is missing no longer, since an anthropologist identified a skull in a Paris museum as that of the French philosopher. Robert Burns' head shape has been recorded.

Shakespeare, curse or no curse, may yet be honored in the manner which a scientific age best understands—by a "reverent and scientific official examination" of his grave.

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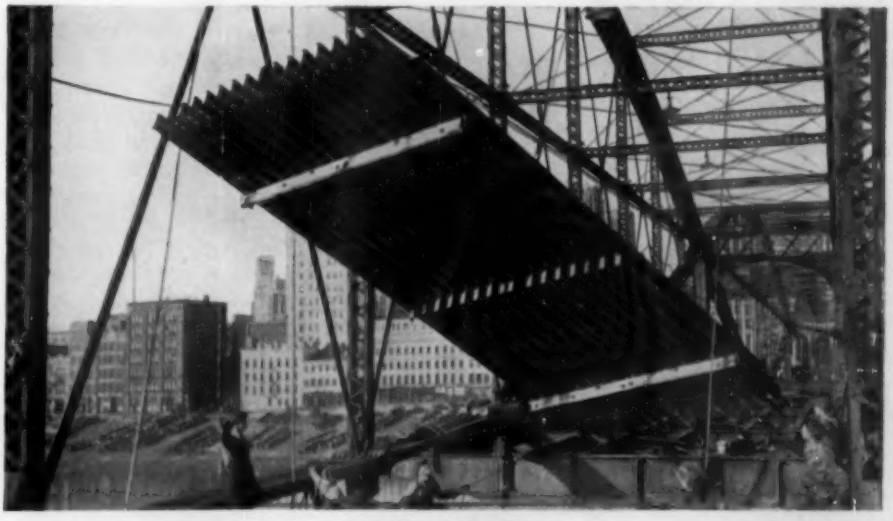
CHEMISTRY

Natural Gas Chemical Extracts Lubricant

PRACTICALLY all automobile lubricating oils contain a substantial fraction of so-called Pennsylvania oil, according to Dr. Ulric B. Bray, petroleum chemist, in a report to an American Chemical Society. The difference between good and poor oil lies in the relative amount of the much-prized Pennsylvania-type ingredients. Many supposedly inferior western oils now prove to contain fifty per cent. or more



TWICE PIONEER

It was a distinct innovation when steel, in addition to wrought iron, was used more than fifty years ago in the design of Pittsburgh's Smithfield Street bridge by the famous bridge builder Lindenthal. Now the structure pioneers again in having its heavy steel and timber floor replaced by one made of aluminum and aluminum alloy. The old bridge seemed doomed until aluminum's lightening of its dead load increased the factor of safety so much that the structure will see many more years of service. The photograph shows an aluminum alloy floor panel being lowered into place.

of the good material, and the question naturally has arisen how to get it out.

Unfortunately distillation, the stock-in-trade process of the oil refiner, does not separate good oil from bad, although it does separate light from heavy. Recent researches show that propane, a normal constituent of liquefied natural gas, can be made to turn the trick. This remarkable substance, cheaply available, looks like gasoline but has a boiling-point of 48 degrees below zero Fahrenheit. It has the ability to dissolve out, or extract, the Pennsylvania type of ingredient, but not the asphalt, paraffin wax and other undesirable components which mar the cheaper lubricants.

Lubricants extracted with propane have the pleasing habit of constancy in viscosity during the process of warming up of a motor. They are thin enough to permit the starter to turn over a cold motor—and at the same time remain sufficiently viscous in a hot motor for proper lubrication.

The new refining method opens wide new resources for manufacture of really good motor oil, since Texas, Oklahoma and California oils, previously thought unsuitable, are available as raw materials. Entirely new and peculiar refining apparatus must be devised, however, to take care of the propane in view of its extremely low boiling point. The whole process will have to be conducted under pressure.

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GENETICS

Broody and Non-Broody Hens Produced By Breeding

BROODINESS in hens, described in old-fashioned rural terms as "always wantin' t' set," can be increased or diminshed by selective breeding, it has been shown by experiments reported by Dr. Frank A. Hays of Massachusetts State College.

Dr. Hays bred two lines of Rhode Island Reds for the opposite tendencies in hen-maternalism, and carried on his experiment for nine years. The broodiness of the line encouraged in this tendency was little less than double that of the non-broody line during the time of the experiment. The annual egg-laying records among the non-broody hens were, as might have been expected, significantly higher than those of their broody relatives.

Science News Letter, January 27, 1934

ASTRONOMY

200-Inch Telescope Mirror To be Poured of Special Glass

THE DISC of the great 200-inch mirror of the new Mt. Wilson Observatory telescope now being built will be made of a superior sort of pyrex glass and it will be poured at Corning, N. Y., in about a month.

Early plans called for a mirror of fused quartz, but now a superior pyrex glass, which has a small volume change with temperature, has been developed for the special purpose of the 200-inch mirror. When a few years hence the new giant telescope is placed in operation on a southern California mountain peak, it will be the world's largest, doubling in one gigantic step the diameter of the world's present largest, the 100-inch on Mt. Wilson, Calif.

At the Corning Glass Works, when the step takes place, the glass will be taken from the furnace at 1500 degrees Centigrade, trucked to the mold and poured at about a thousand degrees. It will be allowed to cool to below 500 degrees and kept until the temperature is uniform throughout. For an ordinary disc 30 inches thick, 24 days would be enough to equalize temperature, but the thick mold which will hold the glass will require a longer time, probably over four months, before the cooling process can begin. This subsequent stage will take about the same time.

Dr. J. A. Anderson of the Mt. Wilson Observatory told how the problems involved in the annealing of glass were solved by American scientists when our European sources of optical glass were shut off during the World War. The staff at the Geophysical Laboratory of the Carnegie Institution of Washington was especially effective. Their work has made the production of the enormous disc feasible.

The oven for the large reflector has already been used to make the 120-inch test plane required for the larger concave mirror. Dr. F. G. Pease, who watched the pouring, said the result was most successful. Preliminary tests for strain showed it to be superior to the excellent 60-inch mirror now used on Mt. Wilson. It was perfectly clear and almost free of bubbles.

The test plane will have the same type of construction as the big mirror. A hexagonal system of ribs will give rigidity without bulk. Nineteen points of support will be provided in these ribs. The supporting levers will be attached in ball bearings so that frictional and elastic distortions will be minimized. The holders will work so that the mirrors can hang upside down.

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PHYSICS

Heavy Hydrogen Born In Neutron-Proton Smash

AN ATOM of heavy weight hydrogen is born with an exhibition of gamma ray fireworks when a neutron smashes into a proton.

This is the latest drama of the atomic world of the minutely small now being explored by physicists. D. E. Lea of famous Cavendish Laboratory, Cambridge University, working with the aid of Dr. J. Chadwick, discoverer of the neutron, reports his experiments and interpretations to *Nature*.

The actors:

PROTON—The kernel, heart or nucleus of an ordinary hydrogen atom.

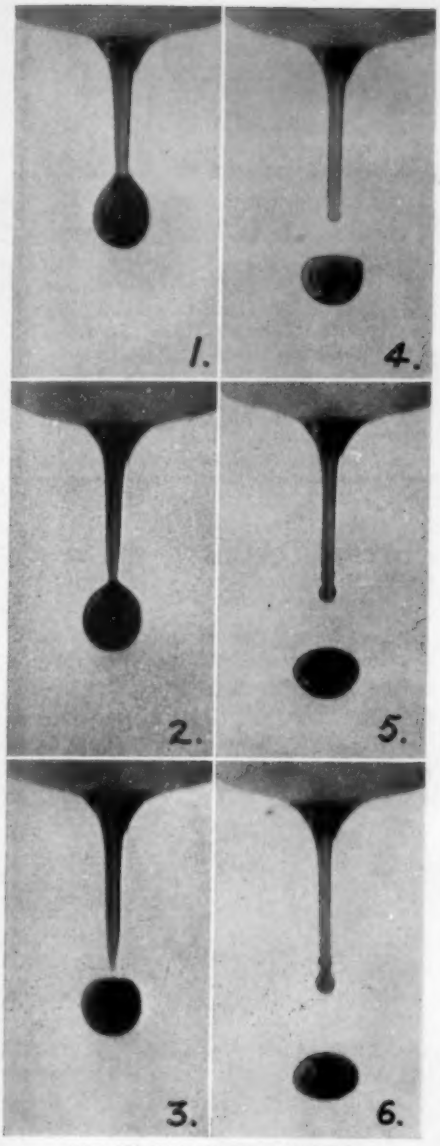
ELECTRON—The famous and ubiquitous unit of negative electricity and, at one and the same time, a fundamental building block of all atoms and matter.

NEUTRON—An electrically neutral particle, probably consisting of a close combination of proton and electron, discovered in England in 1931.

HEAVYWEIGHT HYDROGEN—A variety of hydrogen that is twice the weight of ordinary hydrogen, discovered in America in 1932. Variously called hydrogen isotope mass two, deuterium, and (in England) diplogen.

The drama:

Neutrons given off from the elements, polonium and beryllium, were allowed to smash into paraffin, and the scientists were surprised to find that some gamma radiation, waves such as given off from radioactive substances, was shot backwards. They explain that unusual happening by supposing that in some of the collisions between neutron and proton (contained in the hydrogen of the paraffin), these particles



NO ELONGATION HERE

High speed photographic proof that a falling drop of water does not elongate into the conventional "raindrop" shape, but instead tends to maintain a spherical form, is contained in these photographs showing a drop of inky water falling from a wet electric light bulb. The pictures were taken at the rate of 500 per second with the fast stroboscopic motion picture camera developed at Massachusetts Institute of Technology.

combine to form heavyweight hydrogen. That combination would result in the emission of energy in the form of gamma rays, equal to the loss of weight experienced in the transmutation. This conversion of mass into energy should give rise to million volt gamma rays and this would require the attacking neutrons to have two to six million volt energies, which is about what they have.

PHYSICS

Atomic Bullets Aimed At Secrets of Matter

Preparations Being Made for New Attacks With Powerful Weapons and Recently Discovered Projectiles

CONCENTRATED streams of atomic bullets are being made ready in experimental laboratories for attacking non-living and living matter.

There will be:

1. Attacks upon atoms, investigations of the constitution of matter and transmutations of energy and matter.

2. Explorations of the effect of the newer radiations upon living matter, specifically in the treatment of cancer and upon germplasm with consequent changes in heredity.

The atomic projectiles used are:

Electrons—Units of negative electricity, given off when anything becomes hot, propelled from disintegrating radioactive substances with high speed they are called beta rays, propelled by high voltage they are called cathode rays.

Protons—Nuclei or kernels of hydrogen atoms, units of positive electricity, about 1800 times as heavy as electrons.

Neutrons—Electrically neutral particles, close combinations of proton and electron, discovered 1932.

Deutons—Nuclei or kernels of deuterium or heavy hydrogen atoms, constituted of two protons and one electron. Deuterium discovered 1931.

Alpha particles—Nuclei or kernels of helium atoms, disintegration product of radioactive substances.

Canal Rays

Positive ions—Nuclei or kernels of the various chemical elements. Protons and alpha particles are special kinds of positive ions. Streams of positive ions, propelled by high voltage, are called positive or canal rays.

High-voltage electrical machines constituting "atom guns" of great power are being perfected to speed the atomic particles and make them hit harder and perhaps more effectively.

Most common are the conventional evacuated tubes for producing cathode rays, X-rays, positive or canal rays, etc. They range from a few thousand up to hundreds of thousands of volts. One of the largest of X-ray tubes of more or less conventional type, rating a million volts, is at the California Institute of Technology, Pasadena, Calif.

A whirligig electrical machine, in which reversing magnetic polarity of 85-ton magnets accelerates particles until they obtain speeds equivalent to as much as 3,000,000 volts, has been developed by Prof. E. O. Lawrence and associates of the University of California.

In an airship hangar at Round Hill, Mass., there is a giant electrostatic direct current generator of the Massachusetts Institute of Technology, designed by Dr. Robert J. Van de Graaff, which has generated 7,000,000 volts potential and is capable of 10,000,000.

Atomic Energy Tapped

In addition to these man-made atom guns for speeding atomic particles, the scientists have learned how to tap energies within the atom so as to augment the electrically induced energies.

Most striking are the streams of neutrons produced when the light metal beryllium is bombarded with deutons. Here is an atomic particle unknown a relatively few months ago that can be used to produce unusual streams of another atomic particle also unknown a few months ago.

The research group consisting of H. R. Crane, a graduate student, Dr. C. C. Lauritsen, who developed the C. I. T. million volt X-ray tube, and Dr. A. Soltan, an international research fellow from Poland, working at the Pasadena laboratory, were astonished to find that deutons flung at beryllium metal released many more neutrons than alpha particles (helium nuclei) either artificially speeded or produced by radioactivity. At Berkeley, Calif., Prof. E. O. Lawrence and his colleagues, Drs. M. Stanley Livingston and Malcolm C. Henderson, discovered the same effect.

Both sets of scientists realized that here is a case of transmutation. Dr. G. N. Lewis of the University of California furnished both groups of physicists with some of his very pure heavy water containing deuterium or heavy hy-

drogen. He wanted to know whether the deutons (deuterium nuclei) shattered themselves against heavier atoms. They do not. When propelled against the light beryllium atom they penetrate the nucleus and apparently turn it into boron. In its exuberance the newly born boron nucleus kicks out a neutron with ten million volts energy, so the Pasadena experimenters found.

With the Lawrence whirligig atom gun, the yield of neutrons has been increased until 10,000,000 neutrons per second are produced and the experimenters are confident that at least five times that number will be produced shortly by increasing the current that carries the deutons into the machine.

It is the most concentrated and powerful stream or ray of atomic projectiles that man now has at his command. This artificially produced blast of neutrons is larger than the stream that can be produced by using radium as a bombarding and instigating source.

Neutron streams are not the same sort of radiation as X-rays or as gamma rays from radium. Neutrons are minute atomic particles, while gamma or X-rays are electro-magnetic waves. Neither is neutron radiation the most energetic radiation studied by physicists, for the cosmic rays, some of which consist of high speed particles, have energies in some cases several times greater. Cosmic radiation sprinkles the earth like continuous rain, making it impossible to use it in concentrated form.

The electrical neutrality of the neutron is a great advantage to it when it is used as a tool for penetrating the very hearts of atoms. Ions or kernels of atoms, protons and electrons have electrical fields that complicate the process of penetrating the hearts of atoms.

Investigation of the constitution of matter is the immediate objective of the physicists who have developed these neutron streams and other tools for attacking the atom. Biologists and medical research workers will utilize these newer radiations in experiments to discover their effects on living organisms. First these experiments will be on the lower forms of life, on experimental animals, and then if the results are promising, the investigations will be extended to human beings and possibly to the treatment of diseases for which the radiations are found to be effective.

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PARASITOLOGY

Many Found to be Carriers Of Disease-Causing Amoeba

MINUTE animal parasites, some of them the kind of amoeba that caused the dysentery which was reported as epidemic and took death toll in Chicago this summer, are more widespread in the general population than has been suspected, Drs. D. H. Wenrich, R. M. Stabler and J. H. Arnett of the University of Pennsylvania conclude as the result of a survey of 700 freshmen entering college in 1931 and 1932.

A single examination made for each person showed that about one in 20 harbors the parasite, *Endamoeba histolytica*, which causes the amoebic disease and belongs to the group of microscopic animals known as the protozoa. But the scientists believe that five or six examinations may be required to determine the actual percentage, so that probably about ten per cent. of those examined harbor these parasites.

Most of those with the parasites are not ill, but are carriers who through carelessness may infect others in their community. This is especially true if they are food-handlers.

Surveys made recently in Tennessee show that in the rural populations of that state probably one in five persons harbor the disease-producing amoeba. Closer to the tropics the incidence of the parasite tends to be larger.

One-third of the college freshmen tested once by Drs. Wenrich, Stabler and Arnett were found to harbor one or more of seven kinds of protozoan parasites, including the dysentery-producing amoeba. Four other kinds of amoeba are likely to be confused with the disease-producer and expert knowledge is needed to make the diagnoses. Two other parasites belonging to the flagellate protozoa were found and these are thought by some to produce a mild illness in susceptible persons.

This elaborates previous article (*See SNL, Jan. 6, '34, p. 7.*)

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RADIO

FORESTRY AND YOUTH CONSERVATION

an address by

Ferdinand A. Silcox

Chief Forester of the U. S. Forest Service

Wednesday, January 31, at 4:30 p. m., Eastern Standard Time, over Stations of the Columbia Broadcasting System. Each week a prominent scientist speaks over the Columbia System under the auspices of Science Service.

IMMUNOLOGY

Adrenal Cortex May Give Resistance to Poliomyelitis

DOES the vital cortex of the adrenal glands play a part in developing resistance to infantile paralysis?

Evidence that this may be so and that, at all events, resistance to this disease is not produced in the manner typical for other diseases was presented by Dr. Claus W. Jungeblut of College of Physicians and Surgeons, Columbia University, at the meeting in Philadelphia of the Society of American Bacteriologists.

Dr. Jungeblut was investigating the problem of how blood serum from normal persons inactivates infantile paralysis virus, so that the person whose blood possesses this inactivating power does not acquire the disease even if the virus enters his body.

He tested the anti-virus property of the blood of one monkey both before and after the animal's adrenal glands had been removed. Before the operation the animal's blood serum inactivated the virus, but failed to do so after removal of the adrenal glands. The neutralizing power could be restored to the blood serum, in the test tube at least, by adding a small amount of adrenal cortex hormone but not by adding adrenalin, the hormone from the medulla of the adrenal glands.

He reported many other tests with blood sera possessing antivirus, antibacterial and antitoxic properties which showed indirectly that the substance in human blood which can neutralize or inactivate infantile paralysis is not a typical antibody, in the immunological sense of the word.

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PSYCHOLOGY

Educator Doubts That America Is Nation of 12-Year-Olds

Education Office Expert Says Average Mental Age is 17.7 But Conclusion is Contradictory to Previous Research

THE STATEMENT, often made, that the average intelligence of adult Americans is that of 12-year-old children has been challenged by the U. S. Office of Education's expert on educational tests, Dr. David Segel.

The mental age of adults in the United States is 17.7 years, if a new figure given by Dr. Segel in *School Life*, publication of the Office of Education, is correct.

He deplores the fact that the 12-year figure has been so widely and consistently advertised, resulting in lowering the educational or cultural level of newspapers, magazines, movies and radio presentations.

Is the 12-Year-Old Bright?

The pronouncement that the national intelligence is greater than has been thought will be welcome to many who are loath to consider themselves part of a mentally 12-year-old population. Looked at from another point of view, however, a 12-year mental level is not so alarming. The parents of the modern young adolescent are usually quite willing to admit that Miss 12-Years and her brother are quite capable of outwitting their elders. They surpass many older persons in ability to learn.

Intelligence, as distinguished from education, general knowledge, experience, or skill, is not something that keeps on improving throughout life. As far as the merely physical basis for intelligence is concerned, that is, anatomical development of the brain itself, the boy of six is just as mature as an adult, the anatomist, Dr. T. Wingate Todd, has found.

Growth All Through School

But children throughout the school age do seem to improve in their ability to think—to perform mental tasks such as those included in intelligence tests.

Popular judgment, as reflected in laws, varies concerning the time when persons become mentally mature. A minimum age of 21 must be attained for voting purposes. For driving an automobile, for marriage, for giving testimony in court, and for earning a living, earlier ages are usually sanctioned.

Intelligence testing is still a new science, and comparatively little is now known about the mental makeup of the population in general. Probably the most comprehensive study yet made is the one known as the Later Maturity Study conducted at Stanford and Yale Universities by Dr. W. H. Miles and associates. In this research, tests were given to a sampling of literate persons aged all the way from 7 years to 94.

It was found that the period of growth lasts certainly until the age of 18. Then the period of rapid growth of intelligence is over and it holds or begins to drop, slowly at first but with gradually increasing momentum. After the early twenties, people continue to build up their experience and knowledge, but the peak of their natural ability has already been reached and is just being passed.

Average For Prime Only 17

But this does not mean that everyone, or even most people, ever reach a mental age of 18. According to the Stanford study, the average mental age of youngsters in their teens is 17 years, 3 months, and the average for the twenties is just the same. In the thirties it has dropped to 16 years, 8 months; for the forties, 16 years, 7 months; for the fifties, 15 years, 8 months; for the sixties, 14 years, 8 months; for the seventies, 13 years, 11 months; and for the eighties, 11 years, 7 months.

Wide individual differences were observed. A large number of the aged have ability that tests above the average for younger persons. And, of course, many a youngster is handicapped with ability very low in comparison with his fellows. Persons so dull as to be unable to learn to read and write were not considered in the Stanford study at all.

What is America's mental age?

A large proportion of Uncle Sam's nephews and nieces—some 47 millions—are youngsters who have not yet attained their mental growth. Another large group has passed the time of maximum ability and are on the long gradual down slope where experience is used to counter-balance decreasing natural power. Only a comparatively small number are at the peak. Thus the average mental age is generally cited at a figure well below the 17.7 years found by Dr. Segel, which he defines in terms of "ability to learn."

In determining this average of nearly 18 years, Dr. Segel seems to have ignored all persons under 16 or over 50 years of age as well as failing to take into consideration illiterates, feebleminded in and out of institutions, and the senile. His tabulation includes about 62 millions, or just a little over half—presumably the upper half—of the population of the nation.

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PSYCHOLOGY

Language Facility Gives Advantage in Tests

CHILDREN of the higher economic and social classes are considered superior in intelligence to those less fortunate mainly because of their superiority in the use of language, Dr. Ethel Kawin, of the Institute for Juvenile Research, found in a study just reported by her in a book, "Children of Pre-School Age," published by the University of Chicago.

Children of a nursery school in the Hull-House district of Chicago were compared with those attending a nursery school in Winnetka operated as a joint project of the Winnetka Woman's Club and the Board of Education and attended mainly by the children of professional people. The wealthier children received higher scores on the Stanford-Binet scale, but their advantage was smaller when measured by the Merrill-Palmer Scale in which language is less important, and the difference was smaller still when the language tests were omitted. The poorer children excelled on some of the motor tests.

This finding justifies serious questioning of the accepted viewpoint that the intelligence of children is greater toward the upper end of the social-economic scale, Dr. Kawin concludes, although she warns that the number of cases included in her study are too few to warrant any definite conclusions.

Science News Letter, January 27, 1934

ARCHAEOLOGY

Mexicans Find Old Pyramid While Rescuing Art Works

MEXICAN government archaeologists have been compelled to begin excavations and restorations in the Mayan city of Acancéh, not far from Mérida, Yucatan, in order to save valuable works of art done in stucco molding.

In so doing, they have just uncovered a beautiful little pyramid strikingly like the primitive Mayan pyramid excavated by the Carnegie Institution of Washington in Uaxactun, Guatemala. This find may be another proof that Mayan culture came to Yucatan far earlier than was until recently believed.

A small stuccoed pyramid, half-buried under earth, has been excavated. Four stairways lead to the top, one on each side. Human masks of deities in stucco, more than six feet across, adorn either side of each stairway near the top, making in all eight of these gigantic faces. The corners of the pyramid are rounded, and in other ways the structure resembles the Mayan one.

Acancéh is a modern Indian town built among the pyramids, terraces and ruined temples that formed the official section of the ancient city. The people have let their ancient buildings go to ruin since Spanish Conquest times, although belatedly the governments have been taking care of them.

Science News Letter, January 27, 1934

ICHTHYOLOGY

Poor Fish Ears Hear Some Sounds Very Well

"CAN'T fish here," the sign read. "Some say they can, and some say they can't," remarked the angler as he proceeded to fish.

However, the question was taken up in a more serious manner recently by Prof. Harry Bateman, at a physics research conference of the California Institute of Technology. Being a mathematician, Prof. Bateman has made a study of hearing from the hydrodynamic standpoint. He pointed out that the inner ear, where all the hearing takes place, is filled with a fluid; whereas the outer ear is filled with air.

Between the two is the middle ear with three little bones, the well-known hammer, anvil, and stirrup. These serve as levers by which the vibrations of the eardrum are transmitted to a window of the inner ear, also closed by a membrane, and are at the same time magnified about twenty times. This is nature's way of transmitting the sound from the air to the liquid. Without such a mechanism, Dr. Bateman said, only a thousandth part of the energy of the sound waves would get from the air to the liquid. Incidentally, he remarked that the ear is an even more sensitive organ than the eye.

This now brings us to the fishes. Anatomical investigations have shown that while fishes possess some kind of hearing apparatus, it is at best very poor. Direct tests of their hearing are very difficult, because sounds made in the air are scarcely transmitted to the water at all. If a diaphragm is placed between the air and the water and made to vibrate, or a bell is struck under water, the fish will respond.

Dr. Bateman's final advice was: "Shout all you want while fishing; the fish won't hear you. But don't stump around on the bottom of the boat; that will surely frighten them away."

Science News Letter, January 27, 1934

METEOROLOGY

The Higher the Warmer, Air Pilots Discover

TEMPERATURE inversion, that is, warmer air as one goes higher, is a more common phenomenon in winter than has been suspected, air-line pilots have been discovering lately.

On one day recently, when the ground temperature was only 10 degrees above zero at Chicago, pilots encountered a temperature of 40 degrees at 4,500 feet. On the same day, pilots leaving an 8-degree temperature at the Cheyenne, Wyo., airport found a 36-degree temperature at an elevation of 9,000 feet above sea level.

Reports on air temperature and other weather conditions are given by the pilots every twenty minutes, and are coordinated with information collected and supplied by the far-flung airway weather observation system of the U. S. Weather Bureau.

In the past, it was believed that temperatures invariably lowered as altitude increased, and observations led to the theory that temperature dropped three degrees Fahrenheit with each 1,000-foot increase in elevation above the earth. However, pilots taking off from wintry airports to encounter mild weather at higher elevations have recently supplied evidence that outmoded this belief.

Science News Letter, January 27, 1934

IN SCIENC

BIOCHEMISTRY

Palm Nuts Yield Sex Hormone Duplicate

A SUBSTANCE identical with a female sex hormone, theelin, has been obtained from palm nuts by Prof. A. Butenandt and Prof. H. Jakoby of the University of Göttingen, Germany.

Sex hormones like theelin are spread throughout the whole animal kingdom from the highest down to the lowest single-celled organisms. Similarly acting substances are also found in plants. It has been known for some time that the plant hormones could stimulate sexual activity in animals and that the animal hormones affected the plant's sexual development, stimulating ripening and blossoming.

The reason for this, it appears from the work of Professors Butenandt and Jakoby, is that the sex-stimulating hormone in both plants and animals is the same substance. While their investigation was restricted to palm nuts, it is probable that the sex hormone of all plants is the same.

Science News Letter, January 27, 1934

ASTRONOMY

Old Spots Persist In New Solar Cycle

SUNSPOTS of the old cycle which is now dying still persist in trooping across the face of the sun. Astronomers of the Carnegie Institution's Mt. Wilson Observatory report that a group of sunspots containing from five to sixteen individual spots has been visible on the sun's disc during the past few days.

The first sunspot of the new cycle was seen on October 10. Astronomers can tell whether the great disturbances in the atmosphere of the sun that constitute sunspots are of the old or new cycle by their magnetic polarity. The magnetic orientation of the spots changes at the time of sunspot minimum, which is occurring now. The persistence of spots of the old cycle after the appearance of spots of the new cycle is not unusual.

Science News Letter, January 27, 1934

NCE FIELDS

PHYSICS

Heavy Hydrogen-Lithium Bombardment Yields Helium

WHEN the metal lithium is bombarded with ions of the heavy, mass two isotope of hydrogen, deuteruium, alpha particles are ejected with a speed considerably greater than swiftest alpha particles from radioactive substances, experiments at Cavendish Laboratory, Cambridge, under the direction of Lord Rutherford have shown.

The research shows that a deuterium particle occasionally enters the kernels or nucleus of a lithium atom of mass six and that the nucleus that is formed then breaks up into two alpha particles, which are kernels of helium atoms. These two alpha particles escape in nearly opposite directions.

The capture of a particle by a lithium nucleus of mass seven causes a breakup of the system into two alpha particles and a neutron whose maximum energy is equivalent to fifteen million volts.

Lord Rutherford has received a private communication from Prof. Hertz in Germany which states that he has obtained small quantities of deuterium or heavy hydrogen by applying a special diffusion method of separation to ordinary hydrogen. Such deuterium is so pure that it is impossible to detect the alpha line of ordinary hydrogen in its spectrum.

Science News Letter, January 27, 1934

ORNITHOLOGY

Young Swans Had Human Foster-Father

HOW a National Park Ranger sacrificed sleep, recreation, even meals so that a brood of young trumpeter swans might "get a break" has been told, somewhat belatedly, now that his charges have grown up and flown away to their winter feeding grounds.

The hero of the tale is Ranger Ben Arnold. Last summer a pair of the rare and beautiful trumpeter swans nested in a lake near his bailiwick. Swans had built nests in the Park before, but always some predatory animal or other got the eggs or the helpless cygnets soon after hatching. This time Ranger Arnold vowed he would see them through.

For the first few days he stood guard over the young in the nest practically day and night. Any bird, beast or fish that approached with a carnivorous look in its eye was promptly and vehemently driven away.

Later, he was able to substitute a series of colored flags as "scare-crows," and relax his vigilance somewhat. With his assistance, the swan pair was able to rear five of their six offspring to maturity.

And now, with his erstwhile charges safely somewhere south for the winter, Ranger Arnold has relaxed his silence as well, and allowed the story to come out.

Science News Letter, January 27, 1934

CHEMISTRY

Starfish and Sponges Possible Food Sources

FOOD and vitamins from starfish and red sponges, among the most abundant, most useless and most unappetizing of all sea life along the Atlantic coast, are possibilities hinted at by researches in the Sterling Chemistry Laboratory of Yale University, under the direction of Prof. Treat B. Johnson.

One of the interesting things discovered about starfish is the presence in its tissues of considerable quantities of free amino acids, which are the chemical building-blocks of proteins. In other animals these acids are for the most part bound up in proteins, and before another animal can make use of them it must break the proteins apart by digestion. Just what the scientific significance of uncombined amino acids in starfishes may be, and what practical advantage can be taken of the phenomenon, are points awaiting further investigation.

Red sponges have been found to contain the vegetable pigment carotene, which is the raw material used by animals in making vitamin A. Only red sponges contain this pigment. Getting it out constitutes a terrific laboratory job: a ton of wet sponges yields a hundredth of a pound of carotene.

One of the things hoped for from the researches is further light on the relationship that may exist between vitamin A, which prevents an eye disease, and vitamin D, preventive of rickets.

Science News Letter, January 27, 1934

PHYSIOLOGY

Magnetic Iron Oxide Used in Blood Studies

GAMMA ferric oxide, which is chemically like common iron rust but physically unlike it because it responds to the pull of a magnet, is being used at Yale University in the study of the makeup and migrations of blood cells. When it is injected into the blood stream, it is promptly taken up by the corpuscles, and its subsequent location, learned by magnetic search, shows where iron is stored in the body. Among the other things being investigated by this new method is the function of certain hitherto puzzling cells of the liver.

Gamma ferric oxide has long been known as a chemical curiosity, but it was not until Dr. Oskar Baudisch, a research fellow working with Prof. Treat B. Johnson, began making it up in quantities sufficient for research purposes that its possibilities as a scientific tool began to be appreciated.

This peculiar oxide of iron is of use to the physicist as well as to the physiologist, for it is being employed in the investigation of minute cracks in steel, and also in the study of the relation between magnetism and the internal structure of molecules and atoms.

Science News Letter, January 27, 1934

PALEONTOLOGY

Wyoming Had Its Eagles 15,000,000 Years Ago

WYOMING had its eagles fifteen million years ago as it has them today. Fossil bones of a large eagle, found in Wyoming rocks by George F. Sternberg, have been examined by Dr. Alexander Wetmore, assistant secretary of the Smithsonian Institution of Washington, and prove to be a new species. Dr. Wetmore has named the extinct eagle in honor of Mr. Sternberg. It was a bird resembling the modern golden eagle in many respects, although it had a shorter tail. The fossil bones constitute the most complete representation of an individual bird of its geologic period yet found in America.

Other birds of a less remote past recently identified by Dr. Wetmore include pelicans, ducks, geese, swans, cormorants, grebes, gallinules and rails. These fossils were collected in Idaho by the late Dr. J. W. Gidley.

Science News Letter, January 27, 1934

PSYCHOLOGY

Creating "Language" For Chimpanzees

These Apes Learned to Use Play Money Not Only For Buying Food But Also to Express Abstract Ideas

By MARJORIE VAN DE WATER

AN APE cannot go into the Willard Hotel or the Waldorf-Astoria, read the menu and write his order for a meal. But he can choose the delicacies he wants from the machines in an Automat. Although he cannot speak to tell of his desires, he can express them in this way. And he would buy himself a good meal, too.

Chimpanzees have performed exactly that feat at the Laboratories of Comparative Psychology at Yale University.

Poker chips of various sizes and colors were used for money. And the slot machines, aptly called by the investigators "chimpomats," were especially devised for the experiment. Different chimpomats were used to vend different kinds of food. A white chip would "buy" grapes; a red one bananas; a green one, oranges, etc. An animal, then, in order to obtain a particular food simply had to select the appropriate chip and insert it into the slot of the chimpomat.

The ability to appreciate the value of money as a symbol for what it can buy has heretofore been considered an exclusive attribute of man. These experiments at Yale demonstrate, however, that animals lower in the scale than man can attach a significance to symbols. This is the conclusion of Dr. John B. Wolfe, National Research Council Fellow who conducted the experiment under the direction of Dr. Robert M. Yerkes.

Apes can use "money" to buy the banana or other treat they desire. They can select water-buying tokens when they are thirsty. They can choose a small white token rather than a larger one with smaller purchasing power. They can discard as worthless, brass checks which were the "plug nickels" of the experiment and had no exchange value. They can even "hoard" more of the tokens than they can spend at one time, holding them for future use if not for a rainy day.

It was not an easy task for the apes to do all this, however. The first act was to reach for the food at the opening, and this first step was not so difficult. Even a dull chimpanzee can easily learn where to find a banana. Very soon they came to associate the appearance of the food at the opening with the insertion of the coin by the experimenter, so that as soon as Dr. Wolfe would start to put the tokens into the slot the chimpanzee was ready and waiting to catch the forthcoming banana.

The next step for the animal was to insert the chip itself. But for some reason this was much more difficult. Finally two animals mastered the trick, and then they proved themselves better teachers than the psychologist was. Dr. Wolfe allowed the other two to learn from the experienced apes, and they picked it up much more readily from their ape-instructors.

Other machines were introduced, and other "coins." The chimpanzees had to learn that the white chip would work in one machine but not in another. And they had to learn that one machine would deliver a banana and nothing else, while another would deliver nuts or some other food.

Like the Automat

The problem was quite like that of the diner in the automat restaurant who must learn to go to one machine and insert a nickel for coffee and to another and insert a dime for pie. You can't get coffee from the pie machine by putting in a nickel, nor pie from the coffee machine by inserting the dime.

Mr. Chimp, finding his wealth spread out on the floor, would pick the correct coin, go unhesitatingly to the corresponding chimpomat, and buy what he wanted.

Having demonstrated that the ape has the ability to spend money, Dr. Wolfe began to wonder whether or not he would work for "wages." Could an ape show sufficient foresight to work when the only reward was an inedible chip that he could later spend for food? To a man, the green bills in his pay envelope are a sufficient incentive for his labor; he doesn't have to see before him his reward in food or other desirables. In fact, money has come to mean more to man than the articles it will buy, so that some individuals enjoy the accumulation of money for its own sake. To a very young child, however, a delicious candy or a ride on the merry-go-round forms a much more powerful incentive than the brightest of bright pennies.

Could the ape be taught to work as hard for the "penny" as for the banana it would buy?

This was tested by means of an ingenious work machine. The reward—banana or token—was placed on a bar outside the cage of the ape. It was arranged so that the ape could lift the bar, pulling the reward up to a distance within his grasp. Then weights were placed on the bar so that it became a real task to lift the reward up to the place where it could be secured by the ape. As additional weights were added the work became increasingly harder, and the total weight which the ape was willing to lift became an accurate measure of his desire for that particular reward.

Provided the token on the bar was one which the chimpanzee recognized as a good one—one which would buy the reward he wanted—he would work just as hard to get hold of it as he would for the banana or other tid-bit itself. But if a worthless check were placed there, the chimp was no longer interested in the task.

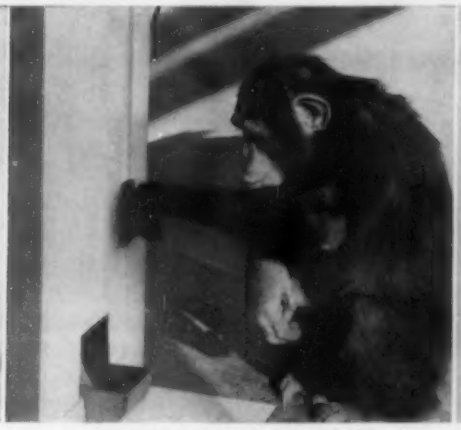
The animal was allowed to go to the chimpomat immediately after he got the money and spend it. But later research may be undertaken to find out whether he can be taught to work today for money that he is not allowed to spend until tomorrow—or next Saturday night.

Substitute for Language

Watching the apes expressing their desire for food by going to the machine of their preference and buying it, Dr. Wolfe was struck with the possibility that these tokens and slot machines might become a substitute for language for the apes.

The author of the Tarzan stories is not the only one who has speculated about the language facilities of these manlike creatures. But despite persistent tests and experiments, there is still no scientific evidence that chimpanzees can learn to speak the language of man

CHOOSING THE COIN



DROPPING IT IN SLOT

EATING HIS PURCHASE

or that man can learn the language of apes, if indeed they have one.

Dr. Robert M. Yerkes, under whose direction Dr. Wolfe has worked, and who is an authority on the intelligence and habits of apes, has himself conducted exhaustive experiments on this point. He found nothing to make him think that the ape has what can be correctly called a language. True, he has calls, and makes a variety of definite sounds, but these are more truly expressions of emotion than of ideas. They are more like man's sighs, or groans, or squeals, than like his words.

All attempts to teach the ape to speak human words have failed, and this failure is in spite of the fact that apes are exceptionally clever at learning to understand what is said to them.

The reason for their apparent inability to speak is due, Dr. Yerkes believes, to a lack of inclination to imitate sounds. The human child, and the parrot in lesser degree, have a natural tendency to copy the sounds they hear, If you say "boo" to a baby, you will soon hear him repeat it after you. The ape will not imitate in this way. He "apes" what he sees; not what he hears. Without this tendency to mimic sounds, the learning of speech is out of the question, even though he has a vocal mechanism that would make speech perfectly possible so far as the psychological equipment is concerned.

Has an Ape Ideas?

Other psychologists have suggested that the ape does not speak because he hasn't the ideas to express. Dr. Wolfe, in considering this theory, allowed the chimpanzee to use the token-technique as a substitute for language. A yellow chip placed in one chimpomat was to indicate that the ape wanted to play or romp around with the examiner. A blue chip placed in another machine would indicate his desire to quit the experiments and return to his living quarters.

The apes learned this more "abstract" use of the machine quite as readily as they learned to get food from the chimpomats. In fact, Dr. Wolfe reports that the use of the blue chip was learned with greater ease than any of the others.

Expresses Dislike

During the course of the experiment, Dr. Wolfe brought in a professional camera man to photograph the animals. One creature took an instant dislike to the stranger. She became so excited that it was difficult to persuade her to do anything that could be used for the picture. Finally Dr. Wolfe spread out on the floor all the various chips that were familiar to the animals. The chimp was allowed her choice.

There was not the slightest hesitation. Instantly she grabbed the blue chip and ran to place it in the proper machine, hustling then to the door to get away from that photographer! She was rewarded. Dr. Wolfe took her at once to her home.

Dr. Wolfe believes that it is perfectly possible for the apes to learn to make change. For example, they might place a white chip in a machine which would deliver not food but two red chips, or a blue chip or perhaps a blue chip and a yellow chip.

In this way it may be possible to learn something of an ape's sense of relative values. A banana is worth more to him than a nut, but would he spend his banana chip in order to secure two nut chips, or three, or five, or a dozen? Or would he exchange it for the blue chip that would give him escape from someone disliked as was the photographer? Or for another that would buy him agreeable companionship with a fellow ape?

These are some of the possibilities that may be explored by further research.

It is also planned to use the same method to discover more concerning the ape's economic attitudes toward his fellows. Will one animal try to secure, by bargaining or by force, the chips earned by another? Will accumulated "money" come to represent power or prestige in the ape community? Will apes learn to hoard, or will they keep their money in circulation?

These are somewhat fanciful questions, but they are questions that it may be possible to answer by this technique, and the answers may show that a great many of the habits of man that we have come to consider a result of the influences of man's civilization are in reality much more fundamental and are shared by him with his ape cousins.

Won't "Play the Machine"

One rather unexpected result of the experiment, and an interesting commentary on the intelligence of apes as compared with that of man, was that the apes never "played the machine" just for the entertainment or pleasure of seeing them work. The ape wants real value for his money.

The chimpanzee, the type of ape used in these experiments, has long been believed to be the most intelligent animal lower than man. And the gap between man and the chimpanzee is shown by these and other experiments to be not nearly so wide as was once supposed.

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SEISMOLOGY

Himalaya "Growing Pains" Blamed For India Quake

"GROWING pains" in the most tremendous mountain system in the world, which is still getting bigger, are probably responsible for the recent disastrous earthquake in northern India. The whole south slope of the great Asian mountain mass is a very active seismic region, and shakedowns of major intensity, such as always accompany the upfolding of mountain ranges, can be expected there at any time.

It is just short of an even generation since the last major earthquake in that neighborhood. In 1905 occurred the great Kangra quake, which was strongly felt in Simla, summer capital of British India.

Major earthquakes in northern India might have been more frequent in recent decades, but for the relief to internal strains in the earth's crust that must have been afforded by the exceedingly severe Assam quake of 1897, in the opinion of Capt. N. H. Heck of the U. S. Coast and Geodetic Survey. This was the most terrific earthquake recorded in the history of the world. It was felt over two and a quarter million square miles, and caused total destruction of all buildings in an area of 12,500 square miles. The tremors it sent through the earth were visible on lake surfaces in Europe.

Other and more recent earthquakes traceable to growth movements of the Himalaya system have caused widespread death and destruction in Burma.

Earthquakes are always most frequent and most severe in regions where the earth's crust is being wrinkled and folded to form mountains. The younger the mountains the greater the seismic activity. Thus, earthquakes have been few and far between in the eastern United States, where the mountain systems are old. The Rockies, which might be classified as mountains in early middle age, are the scene of occasional quakes, while the Pacific coast, with its young and actively growing Coast Range infants, have earthquakes with considerable frequency. The great mountain arc that starts in Alaska and swings down the western shore of the Pacific through Kamchatka, Japan and the Philippines, is one of the most actively growing mountain regions of the world, and also one of the most lively of the earth's earthquake zones.

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ANATOMY

Anatomist Finds Way to Measure Inside of Skull

THE FIRST instrument enabling science to measure accurately the interior of the human skull has been invented, scientists hope.

In a demonstration before the Royal Anthropological Institute, London, the inventor of the instrument, Dr. K. Wagner, assistant professor of anatomy at Oslo University, showed that previous views about the asymmetry of the human skull may be revised.

The difference in size and shape of the two hemispheres of the brain is an important feature of anatomy which has never been completely explained. The interior of the skullcap, which fits neatly over the brain, shows these irregularities.

Dr. Wagner's instrument consists of a metal bar, from the end of which slightly flexible arms project. When inserted within a skull, the adjustable arms give the measurement, which is read directly from a scale on a bar. A small mirror on the instrument enables accurate placing of the arm ends against the bone.

Dr. Wagner told of examining 369 skulls of Norwegians, Lapps, Eskimos, Maoris, and Australians. His tentative report is that the typical human skull is asymmetrical by having the left hemisphere longer and the right hemisphere broader. This finding differs from previous scientific reports on Egyptian skulls, which were made with calipers and were admittedly unsatisfactory.

Many British scientists, expressing interest in the new device, urged renewed efforts to solve the mysteries of asymmetry.

Wilfred Le Gros Clark, professor of anatomy at St. Thomas' Hospital, reported researches on asymmetry begun in Borneo fourteen years ago. His studies stress three factors as linked with brain and skull shape. These are right-handedness, distribution of the veins, and a characteristic skew which is found in the Chinese brain. Dr. Clark mentioned observing forehead veins in men who had been playing tennis, and finding that in 14 out of 19 men, the last forehead vein on the right was more prominent.

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PHYSIOLOGY

Soda Not Secret Of Male Sex in Rats

PROSPECTIVE mothers who desire that the baby be a boy should not put reliance in a widely heralded claim that additions of baking soda to their food will cause a male child to be born.

Prof. Fred E. D'Amour of the University of Denver at Denver, Colo., has tested the theory in extensive experimentation with rats and finds that the feeding of sodium bicarbonate has no effect on the sex ratio of the rat offspring. His report appears in *Science*.

Although there appeared to be no physiological basis for the claim that ingestion of sodium bicarbonate during pregnancy causes the birth of males exclusively, both in the human and in the dog, Prof. D'Amour decided to test the idea. An increase in the size of his experimental rat colony was needed and the baking soda experiment was made as an incidental, but carefully controlled, procedure.

In 35 litters produced from parents who were fed sodium bicarbonate the sex ratio was 115 females to 110 males. In 38 litters fed lactic or sour milk acid in contrast to the basic soda diet, the sex ratio was 117 females to 100 males. In 14 control litters on regular diet, the sex ratio was 103 females to 100 males. The soda and acid were added to the regular rat menu to the extent of 2½ and 5 per cent.

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ARCHAEOLOGY

Egypt's Garden of Eden Invaded by Archaeologists

EGYPT believed that the first living creatures of the earth appeared on a bit of high dry land in the midst of a primordial ocean.

It was also said that when the sun god rose for the first time, he rested on a high place.

Like human beings of all times, the Egyptians liked to point to historic spots and see for themselves where important events happened. They associated their "book of genesis" with Hermopolis, which was certainly a very old place, as all Egyptians knew.

With pomp and ceremony the dramatic events of creation were remembered on great days in Hermopolis.

Now this Hermopolis, unique even among Egypt's remarkable cities, is being excavated. A German expedition is working from season to season under Dr. Gunther Roeder, director of the Pelizaeus Museum of Hildesheim.

Lecturing before the Archaeological Society of Washington, Dr. Roeder told how the scenes of Egypt's genesis are being restored to the light of day.

"When we trenched into the ruins of the buried town," he explained, "we found a district 1500 by 1800 feet. It was surrounded by a great wall, and within it there were no human dwellings. We knew that this was the religious center of Hermopolis, where we should have to look for the scenes of the appearance of light and life."

The expedition identified the temple built by Pharaoh Seti II as the temple of the eight primordial gods. Four of these gods were snakes and four were frogs. In the perplexing Egyptian theology, these eight gods were fused as a total in the great god Thoth who spoke the words which brought heaven and earth into being.

"Everywhere we begin to dig, we make interesting finds," declared Dr. Roeder. "The ground is filled with monuments."

The latest discovery is a temple dating back to 2000 B. C. and having a great gateway of the pylon type. This is believed to be one of the very early appearances of the pylon which became so important a feature of Egyptian architecture. This temple may even point to the time of its invention.

A temple still being sought is one that Queen Hatshepsut is known to have built at Hermopolis. There is hope of finding this temple in coming seasons of exploration, Dr. Roeder declared.

Other great names of Egypt are appearing from the ruins in the city of the creation ceremonies. Even the Pharaoh Ikhnaton, who is known today as Tutenkhamon's father-in-law, but who was more famous in his own career as a heretic king who overthrew old gods and worshipped a supreme deity, is represented by carvings at old Hermopolis.

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CHEMISTRY

Heated Gypsum Becomes Useful, Thirsty Chemical

CALCIUM sulfate, specially prepared by a simple process, joins the ranks of thirsty substances known to chemists as "drying agents." The new preparation is called "soluble anhydrite." It is thus contrasted with common or insoluble anhydrite, a mineral of apparently the same chemical composition, but different behavior.

Prof. W. A. Hammond of Antioch College, Yellow Springs, Ohio, and Prof. J. R. Withrow of Ohio State University, report that calcium, or lime, sulfate, cheaply available and known for hundreds of years, has surprising powers of taking water away from other material. Common distillery alcohol, normally containing several per cent. of water, at once becomes absolute, or practically 100 per cent., by merely being shaken with the new soluble anhydrite. Numerous other liquids which must be thoroughly dried, or freed from water, before use in chemical processes, may now be desiccated.

Most drying agents are either expensive, corrosive or not thorough in action. Soluble anhydrite escapes these three evils, but does have one drawback—it will absorb only six per cent. of its own weight in water. It does not do much, but does that little well. Other agents, such as calcium chloride, absorb greater quantities under favorable circumstances, but will not strip a liquid of water so thoroughly.

Apparently the virtues of anhydrite were overlooked for generations, after plaster-of-Paris chemists had reported that neither the mineral anhydrite nor its artificial imitation made in a furnace would absorb water. Profs. Hammond and Withrow now find that the cautious heating of ordinary gypsum, a compound of calcium sulfate with water, for three hours in an oven at 460 degrees Fahrenheit yields a reactive form of the sulfate which drinks in water with great avidity.

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PHYSIOLOGY

Frog Tadpole Tails Successfully Transplanted

MAKING frog tadpole tails grow on the bodies of young salamanders (distant zoological cousins of the frog) was the feat reported to the American Society of Zoologists by Eli D. Goldsmith of Harvard University. The tail-buds were cut off the frog embryos while they were very young, and planted almost anywhere on the salamander larvae. The tails grew.

When the gills of the salamanders began to disappear, indicating approaching maturity, the tadpole tails decreased in size and vanished, as though they were on maturing frogs.

Science News Letter, January 27, 1934

RADIO

Tests of Radio During Eclipse of Sun Urged

RADIO experts are urging observations of the "radio roof" of the world during the coming St. Valentine's Day total solar eclipse that will darken a narrow strip of the Pacific stretching

Study Nature

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PROFESSOR GEORGE R. GREEN
Director of Nature Camps

The Pennsylvania State College
State College, Pa.

from Borneo to off the Alaskan coast.

By sending radio waves and allowing them to be reflected by the ionized layers of the earth's upper atmosphere, it is possible to determine the effect that the moon's shadow and the solar eclipse have on the ionized layers at heights of 70 to 130 miles. This is of importance practically to radio broadcasting and communication.

K. A. Norton of the U. S. Bureau of Standards, who was one of the group of physicists who observed the radio effects of the 1932 eclipse of the sun, has urged the importance of similar observations at the coming eclipse.

So far as known, no preparations for special radio observations have been made by Americans. It is believed that the Japanese are planning radio observations.

Science News Letter, January 27, 1934

Front Cover Picture

BEAUTY is, indeed, the most important if not the only reason for the choice of this week's front cover picture. A glass insulator, of the kind that electrically isolates high tension so that they may carry their power uninterruptedly, is shown flashing over after withstanding a potential of 125,000 volts. A routine laboratory operation at the University of Wisconsin has been glorified by the photographer.

The photograph does not show the insulator in the position in which it is used on power lines. To make the picture fit the frame of the cover it has been turned clockwise through a right angle. Ordinarily the tube conductor shown on the right of the picture would be across the top.

Science News Letter, January 27, 1934

OCEANOGRAPHY

Expedition Will Study Sargasso Weed and Flying Fish

FANTASTIC tales about the secrets of the Sargasso Sea had better be published in the very near future or forever be relegated to the trunk in the attic, for the secrets of this region are going to be subjected to the matter-of-fact scrutiny of an expedition of scientists, whose boat, it is expected, will not be enmeshed in the sea-weed and "never return to tell the tale."

Last Saturday the research ship *Atlantis*, sailed from Woods Hole, Mass., bearing an expedition sponsored by Yale University and Woods Hole Oceanographic Institution which will go to the Central American Seas and there make investigations not only of Sargasso sea weed and animals, but also of the flying fishes of those waters. Under the leadership of Prof. Albert E. Parr, Curator of the Bingham Oceanographic Collection of Yale University and Research Associate of Woods Hole Oceanographic Institution, the expedition will also complete the investigations of two previous cruises by hydrographic observations in the sectors between Jamaica and Central America, and between the Caiman Islands and the southern coast of Cuba.

Yale scientists explained that there are few biological phenomena in the sea of a similar magnitude which have been subject to such entirely countradictory views among scientists as have the floating Sargasso weeds. Some hold that the floating weeds lead a life of their own, essentially independent of any contribution of weeds torn away from the bottom, growing and multiplying by breaking apart as they grow; while others maintain that the floating weeds are only to be regarded as short-lived fragments recently torn loose from the bottom.

One of the chief difficulties, and also one of the most interesting points in the biology of the weeds, it was pointed out, is that the floating weeds never form fruit-leaves and multiply by reproduction, but increase only by growth and subdivision. Since the characters of the fruit-leaves, however, are the main characters for the identification of the weeds, it has been impossible to prove or to disprove the identity of the floating weeds with any weed found growing on the bottom and the problem of the origin of the floating weeds naturally hinges upon this question. During the cruise preliminary attempts will be made to apply to the floating Sargasso-weeds a method recently developed by marine botanists for inducing the formation of fruit-leaves and causing reproduction of marine algae under experimental conditions. If the treatment proves effective, it will offer a possibility of settling the question as to their origin.

By continuous towing of a surface collector, the expedition will also attempt to obtain approximate figures for the actual amount of floating weed present in the areas visited. Heretofore the records of distribution of the floating weed have been based chiefly upon such observations as the frequency with which large rafts have been noticed from passing ships, which does not give information as to the actual quantities present in terms of weights or measurements.

C. M. Breder, of the New York Aquarium, will also participate in the cruise, as a Research Associate of the Bingham Oceanographic Laboratory. He will study the habits, development and relationships of the flying fishes about which surprisingly little is known despite the wide attention they always attract among travelers.

Science News Letter, January 27, 1934

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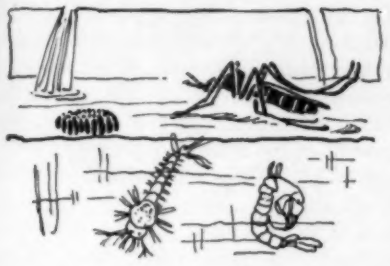
NATURE RAMBLINGS
by Frank Thone

PARASITOLOGY



Trouble by Threes

WHILE it proverbially takes but two to make a quarrel, to make certain sicknesses it takes three.

Many ordinary diseases, like typhoid fever, diphtheria and boils, are affairs of two parties only, like ordinary quarrels. They concern only the germ that makes the trouble and the person in whom the trouble is made—technically (and somewhat ironically) called the "host." The germs of such diseases can go directly from one such afflicted host to another person and set up housekeeping in his tissues without further ado.

But there is a whole series of disease-causing organisms that prey upon lower animals and plants as well as man, that cannot go from one host directly to another individual of the same species. They are always parasites that have a rather complicated life cycle, sometimes appearing in such varied forms at different periods of their existence that at first they are mistaken for entirely separate species until the whole evil career has been traced in detail, and all its stages known. As a rule, one of these complex-lived troublemakers will pass through one or more of its phases in the body of one animal, and then have to complete its life cycle in the body of another. Such a proceeding is known to medical scientists as an "alternation of hosts."

Perhaps the most familiar example of such a host-alternating disease is malaria. The one-celled animal parasite that causes "chills 'n' fever" goes through part of its development in the human body, but before it can receive the power to infect another human being it must spend a time in the body of its alternate host, the Anopheles mosquito. Malaria of birds, a disease similar to but not identical with that of man, has a similar alternation of hosts.

Animals also have diseases, that require an alternation of hosts. Tapeworm of cats must spend part of its life in mice. The route of transmission is simple and easy to follow here; but not so easy in the case of a liver disease of sheep, the causal organism of which uses a snail as its alternate host. But it is a water snail, and sheep drink water—so the evil circle can close itself very readily after all.

Plants also suffer from diseases with alternate hosts, most of them caused by various forms of parasitic fungi. Thus, the black stem rust of grains has the common barberry as its alternate host, while the crown rust of oats shifts to buckthorn, another ornamental shrub, for part of its life cycle. In fact, all the rust diseases of plants—and their name is legion—are preyers upon alternate hosts, which are usually quite unrelated to each other botanically.

Science News Letter, January 27, 1934

NUTRITION

Prizes For Discovery Of Vitamin Requirements

FOR determining how much vitamin A is needed by human beings, a pharmaceutical firm, Mead, Johnson and Co., is offering $20,000 in two awards. The first award of $15,000 is for clinical research and the second of $5,000 is for laboratory research.

Present knowledge of this vitamin is largely based on investigations with rats, which become blind and die when completely deprived of vitamin A. The award is offered in the hope of stimulating research that will yield exact knowledge as to why or whether human beings need vitamin A and just how much of it is needed. Ten physicians and biochemists of high standing have consented to act as judges. The time limit has been set as Dec. 31, 1934, but this may, at the discretion of the judges, be extended to Dec. 31, 1936.

Science News Letter, January 27, 1934

•First Glances at New Books

Additional Reviews On Page 64

Physics

THE PHYSICS OF ELECTRON TUBES—L. R. Koller—*McGraw-Hill,* 205 p., $3. Fundamental physical phenomena involved in the operation of electron tubes are treated from a point of view which will be helpful to engineers and students of physics who have had no special training in electronics. The author is a physicist in the General Electric Research Laboratory and the volume is one of the International Series in Physics edited by Dr. F. K. Richtmyer.

Science News Letter, January 27, 1934

Radio

RADIO AND EDUCATION—Edited by Levering Tyson—*Univ. of Chicago Press,* 197 p., $2.50. These proceedings of the third annual assembly of the National Advisory Council on Radio in Education contain valuable information upon the intellectual uses of radio broadcasting.

Science News Letter, January 27, 1934

Electricity

ELECTRIC METERS—Richard R. Ranson—*American Technical Society,* 232 p., $2. A practical treatise on direct-current and alternating-current meters, measurements of power and resistance, reading and testing of watt-hour and graphic meters.

Science News Letter, January 27, 1934

Forestry

THE PEOPLE'S FORESTS—Robert Marshall—*Smith and Haas,* 233 p., $2. The scientist, who after a year's study in Alaska wrote Arctic Village, a Literary Guild selection, turns his talents to the preparation of a well-written, interesting and informative presentation of our forest problem. He advocates government ownership of forests.

Science News Letter, January 27, 1934

Paleontology

AN OLIGOCENE EAGLE FROM WYOMING—Alexander Wetmore—*Smithsonian Inst.* 9 p., 10c.

Science News Letter, January 27, 1934

Vocational Guidance

VOCATIONS—William Martin Proctor—*Houghton Mifflin,* 390 p., $1.48. A revised and enlarged edition of a textbook for use in high schools.

Science News Letter, January 27, 1934

Paleontology

PLIOCENE BIRD REMAINS FROM IDAHO—Alexander Wetmore—*Smithsonian Inst.,* 12 p., 10c.

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Paleontology

THE BRYOZOAN FAUNA OF THE VINCENTOWN LIMESAND—Ferdinand Canu and Ray S. Bassler—*Govt. Print. Off.,* v+108 p., 21 pl., 20c.

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First Glances at New Books

Additional Reviews On Page 63

Geography

CHINA'S GEOGRAPHIC FOUNDATIONS—George Babcock Cressey—*McGraw-Hill*, 435 p., $4. The author, now chairman of the Department of Geology and Geography of Syracuse University, entered China in 1923 by way of the Gobi desert to become geologist at the University of Shanghai. During the next six years he traveled 30,000 miles in China, considerable journeying disturbed not a little by banditry and civil warfare. Although many delays, including the loss of all maps and photographs in the destruction of a Shanghai printing plant by the Japanese in 1932, held up the production of the volume, the final publication, a complete re-write of the first assembly of material, is good and timely. This survey of China and its people is so well written and interesting that it will attract the intelligent layman and so thorough and full of fact that it will become valuable study for the geographer and geologist.

Science News Letter, January 27, 1934

Psychology

APPLIED PSYCHOLOGY—Richard Wellington Husband—*Harper*, 654 p., $2.90. By far the major part of this college text book is devoted to vocational guidance, employment procedures, and industrial psychology. Among the other applications of psychology discussed are advertising, salesmanship, psychiatry and medicine, law, athletics, physical efficiency and study.

Science News Letter, January 27, 1934

Medicine

METABOLIC DISEASES AND THEIR TREATMENT—Erich Grafe—*Lea and Febiger*, 551 p., $6.50. Translated from the revised German edition by Margaret Galt Boise under the supervision of Eugene F. Du Bois and Henry B. Richardson. The book discusses metabolic diseases from the practical and clinical viewpoint, rather than from the theoretical and physiological. It should therefore be particularly helpful to physicians and medical students, for whom it is written. It is, of course, too technical for lay reading.

Science News Letter, January 27, 1934

History-Economics

FLORENTINE MERCHANTS IN THE AGE OF THE MEDICI—Edited by Gertrude Randolph Bramlette Richards—*Harvard Univ. Press*, 342 p., $4.50. "As patrons of culture," writes Dr. Richards, "the Medici of Florence are familiar figures; as captains of industry they are practically unknown." It follows that there is much of historic and economic interest in this pioneering volume of commercial records. The greater part of the volume is devoted to translations, with explanatory notes, of letters and documents of the Medici firm of merchant-employers during the period from 1400 to 1600. The study was made possible by the loan of the Selfridge Collection of Medici Manuscripts to Harvard.

Science News Letter, January 27, 1934

Adventure-Nature Study

GIFF AND STIFF IN THE SOUTH SEAS—Gifford Bryce Pinchot—*Winston*, xi +241 p., $2. This is a boy's book in a double sense: it is not only for boys but by a boy, the son of Governor Pinchot. With "Stiff," his roommate, "Giff" voyaged with his father down to the middle of the South Pacific where the water and the air, and what land there is, are full of all sorts of interesting things. Young Mr. Pinchot tells of all of this in good, straightforward schoolboy English, and adds indubitable photographs to prove his tallest tales.

Science News Letter, January 27, 1934

Zoology

ALL ABOUT FISH—W. S. Berridge—*McBride*, 254 p., $2.50. The title of this book understates its scope, for the author reaches out and includes all manner of things that live in the water, from sea anemones and hermit crabs to whales, in his lively and interesting popular discussion. Especially to be noted are the illustrations: fish, even in well-illuminated aquarium tanks, are among the hardest things in the world to photograph decently, yet the author has well over a hundred such pictures, all of them excellent.

Science News Letter, January 27, 1934

General Science

REPORT OF THE SECRETARY OF THE SMITHSONIAN INSTITUTION AND FINANCIAL REPORT OF THE EXECUTIVE COMMITTEE OF THE BOARD OF REGENTS 1933—Smithsonian Inst.—*Govt. Print. Off.*, 194 p., free.

Science News Letter, January 27, 1934

Biography

MORE THAN GOLD IN CALIFORNIA 1849-1933—Mary Bennett Ritter—*Professional Press, (Berkeley, Calif.)*, 451 p., $3.50. Daughter of a "Forty-Niner," Mrs. Ritter has grown up with her State, achieving the double success of being in her own right one of its foremost citizens and being the wife of a scientist of world-wide reputation. Her story epitomizes the amazing epic of America: within a life-span of about the scripturally allotted length she and her community have moved from pioneer conditions where the intensive daily concern was with the simplest problems of subsistence to a cosmopolitan culture that on terms of equality exchanges knowledge and influences with the whole world. Of immediate interest to readers of the SCIENCE NEWS LETTER will be the many interesting side-lights cast upon the lives and careers of Dr. William Emerson Ritter and E. W. Scripps, co-founders of Science Service.

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Engineering

FIRST STEPS IN AIR CONDITIONING—A. J. Mellish—*Edwin A. Scott Pub. Co.*, 85 p., $2. Simplified lessons in forced air heating, edited from articles published by the trade journal, Sheet Metal Worker, are given as introduction to more detailed study of air conditioning.

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Ethnology

THE BOOK OF CHILAM BALAM OF CHUMAYEL—Ralph L. Roys—*Carnegie Institution of Washington*, 229 p., 48 text-figures, paper $3.75, cloth $4.75. This sacred book, named after an Indian prophet of the late fifteenth century in Yucatan, contains much information shedding light on the customs and attitudes of the Mayas. The compilation known today dates from about 1782 and is in Mayan language but European script. This new publication presents both Mayan text and translation, with many footnotes that help greatly toward a fuller understanding of the prophecies, rituals, historic narratives, and other writings.

Science News Letter, January 27, 1934

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